

Preparing EFL Medical Undergraduates for Future Studies and Practices: The Establishment and Implementation of a Medical Word List

AGAWA, Toshie※
NEALY, Marcellus※※

Abstract:

Preparing EFL Medical Undergraduates for Future Studies and Practices: The Establishment and Implementation of a Medical Word List

The objectives of this paper are to show the process of a medical word list development and illustrate how the list was implemented at a medical English course for Japanese EFL learners. Adapting Basturkmen's (2010) framework, four steps were taken: present situation analysis, target situation analysis, learner factor analysis, and teaching context analysis. First, present situation analysis was conducted by reviewing the first-year curriculum to identify the present level of students' knowledge. Then, target situation/terms were identified by interviewing medical education experts and reviewing second- and third-year curricula. The results of the interviews also suggested that English terminology be presented in accordance with mainstream medical courses being offered by the university. Considering learner factors, such as learners' perception of needs and motivation, two second-year students were invited to participate in the list development. They and the first author of this paper met regularly to make the list more useful and meaningful for the students. Lastly, teaching context was considered when deciding the methods of list presentation, giving weekly quizzes, and offering review activities in class. Students' scores for the terminology section of the final exam and a questionnaire conducted at the end of the academic year show students' positive learning outcomes, and students' generally positive attitude towards the medical word list and its implementation.

Keywords: medical terminology list, needs analysis, English for specific purposes

※ Associate Professor, Seisen University

※※ Associate Professor, Juntendo University

要 旨：

本稿では、都内の私立大学 (以下 J 大学) 医学部 2, 3 年生向けの医学関連の英語語彙リストの開発と、そのリストの英語授業における活用について論じる。医学英語語彙リストの開発にあたっては、Basturkmen (2010) の枠組みに沿って「現状の分析」「目標の設定」「学習者要因分析」「教育文脈分析」の 4 ステップが踏まれた。まず、J 大学生の 2 年次開始時点での生物学、医学、医学英語の知識を明らかにする (現状の分析) ために、J 大学入学者の選択した理科系入試科目ならびに 1 年次の大学カリキュラムを精査した。次に、医学教育の専門家を対象とした面接調査と、J 大学 2, 3 年生のカリキュラムにもとづき、医学部生が英語授業を通じて身に着けるべき医学英語語彙の種類とレベルを設定した。また、学習者要因に関しては、学生に実際に語彙リスト開発に関わってもらうことによって、リスト開発過程を通じて、学習者のニーズと動機づけを考慮できるようにした。最後に、語彙リストをどういったタイミングでどのように提示するかについてや、授業内小テスト、復習活動等、実際の授業実践に関する方向性が、現場の教育文脈を考慮しながら決定された。リストの英語授業内活用の効果検証には、中間・期末試験の医学英語語彙セクションの正解率ならびに学生に対する質問紙調査が用いられた。定期試験のスコアから、学生が医学英語語彙の習得を進めることができたことが示され、質問紙調査の結果から、医学英語語彙リストとリストを用いた英語授業実践に対し、学生がおおむね前向きな態度であることが示された。

キーワード：

医学英語語彙リスト ニーズ分析 専門英語教育 (ESP)

Introduction

The acquisition of vocabulary is considered to be an essential component of language learning (Nation, 2001). The range and depth of the vocabulary of a language learner greatly influence the reading comprehension of learners' target language (Hsu, 2013). Furthermore, vocabulary knowledge helps learners to perform other language skills such as listening, speaking, reading, and writing (Nation, 1994). Using a word list is one of the learning strategies widely used in the Japanese EFL setting (Schmitt, 1997). Although some instructors may prefer incidental vocabulary learning, such as extensive reading, to intentional one, such as the memorization of a word list, several studies indicate the usefulness of word lists in vocabulary learning (e.g., Hoshino, 2010; Laufer & Shmeli, 1997).

At J University, which is a private medical school in Tokyo, students are required to memorize words related to the medical field in English and Japanese. The acquisition of new vocabulary is both incidental and intentional. Outside of the English language classroom, students are exposed to vocabulary in other classes through lectures, reading assignments, videos, and clinical observation. They are also required to memorize word lists.

In the past, the medical vocabulary students learned in English classes was independent of other classes being taught in Japanese, such as anatomy and physiology. In order to improve learning outcomes, we set out to redesign the English language curriculum in a way that complemented and reinforced the information students were being exposed to in their other classes. In this way, we hoped to facilitate motivation and improve learning outcomes. While there are many books on the market that provide word lists for English language learners that are specific to the field of medicine, we needed a list that was specific to our learning environment. For this reason, it was necessary for us to develop a word list that would better align with our teaching goals and our students' needs.

In this study, we examine the theoretical framework and processes used to compile our own word list. It should be noted here that vocabulary, medical

terminology, and word list are terms that we will be using interchangeably to refer to the word list mentioned above.

Research Background and Rationale

As an effective use of word lists, Folse (2004) suggested instructors arrange an existing word list, rather than completely rely on it, to meet their students' needs. This claim is particularly relevant when a language is taught for specific purposes where the learner's objectives for learning the language tend to be narrowly defined. In this section, we review a few existing medical terminology lists and discuss their (un)adaptability into our own teaching setting in order to illustrate why it was necessary to develop our own.

As far as we know, only a handful of studies have been conducted on the establishment of medical word lists. For example, Wang, Liang, and Ge (2008) compiled the Medical Academic Word List (MAWL) based on a corpus containing 1,093,011 running words found in research articles in the medical and dentistry disciplines. The list aimed to cover general academic terms in medicine rather than highly specialized ones. Wang et al. suggested that MAWL would help students, instructors, and medical professionals learn and use medical terms in reading and writing. However, some researchers have pointed out that many of the words on the list were too general. For instance, Hsu (2013) indicated that 342 out of 623 MAWL words overlapped with the interdisciplinary Academic Word List (AWL). She further pointed out that many of the overlapping terms were within the range of highly frequent words. The overlapped words included terms such as *area*, *code*, *data*, *final*, *period*, and *role*. With regard to our own students, the inclusion of high frequency words meant that MAWL was too basic since the students' average TOEFL ITP score exceeded 530 at the end of their first academic year.

A supplementary list to MAWL was developed by Mungra and Canziani (2013). They established the Medical Academic Word List for clinical case reports (MAWLcc). This list may be useful for our students in the later years of their study as they expand their clinical knowledge and experience. However,

since the target grade for implementation of the word list was second and third year, MAWLcc would have been extremely challenging since students at this level have little to no clinical knowledge or experience, to understand how the MAWLcc words are being used in the context of the medical practice. For this reason, we began to examine other lists for potential use.

Hsu (2013) developed the Medical Word List (MWL) for EFL medical undergraduates in Taiwan. MWL is based on a corpus covering 155 medical textbooks across 31 medical subject fields. The aim of the list was to help enable students to understand medical textbooks. Most medical textbooks available in Taiwan are written in English and therefore it is vital for Taiwanese medical students to know a wide range medical terms in English. Both Taiwan and Japan are EFL countries, yet, the situations are quite different between them. Taiwanese medical undergraduates study medicine mostly from textbooks written in English, while Japanese medical schools commonly use textbooks written in or translated into Japanese. This suggests that the needs of Taiwanese medical students are different from those of Japanese medical students and therefore the MWL would not have been applicable to our students.

As seen in the examples above, a review of existing medical word lists suggested that their use was not feasible without large-scale changes to fit our students' English level, medical knowledge, and learning context. Rather than adapting an existing word list, we decided to compile our own so that we could better meet the learning needs of our students. Those needs are to learn vocabulary that is in line with other subjects, to better understand the relationship between the words they are learning and the students' understanding of medicine at the second and third-year level, and to have English words run parallel to and reinforce the words they are learning in Japanese. By creating a word list that aligns with our students' needs, we aimed to better facilitate motivation and learning.

Another factor that influenced the need for list development is the fact that the science requirement for the university entrance exam is divided into

two paths, biology and physics. Students can choose which type of exam they would like to take. A majority of students selected physics instead of biology. As a result, a large portion of the first-year biology classes review high school-level biology leaving students with little opportunity to be exposed to more advanced biological vocabulary. While there is an elective biology course for first-year students, which is taught in English, it is an elective, which means only a limited number of students can get exposure to biological terms in English.

Finally, there are no English for Specific Purposes (ESP) classes offered to first-year students. Instead, first-year English courses focus on TOEFL and IELTS preparation since all students are required to take TOEFL and encouraged to take the IELTS by the end of their first academic year. Some English instructors select materials which are related to health and fitness in an attempt to address students' interests in health-related topics, however, students had not been exposed to English medical vocabulary in a systematic manner.

The Purposes of This Study

The aims of this paper are to 1) show the process of the medical word list development and 2) demonstrate how the list was implemented in a medical English course for Japanese EFL learners.

Methodology

We began developing a word list for a course called English for Medicine. These are ESP classes which must be taken by all second and third-year undergraduate medical students. Figure 1 shows the word list development and implementation flowchart. The details of each step are provided in the subsections below. After the list was developed and implemented, students' exam scores and attitudes towards the list were analyzed to evaluate effectiveness. Finally, suggestions for list improvement were put forth by the students.

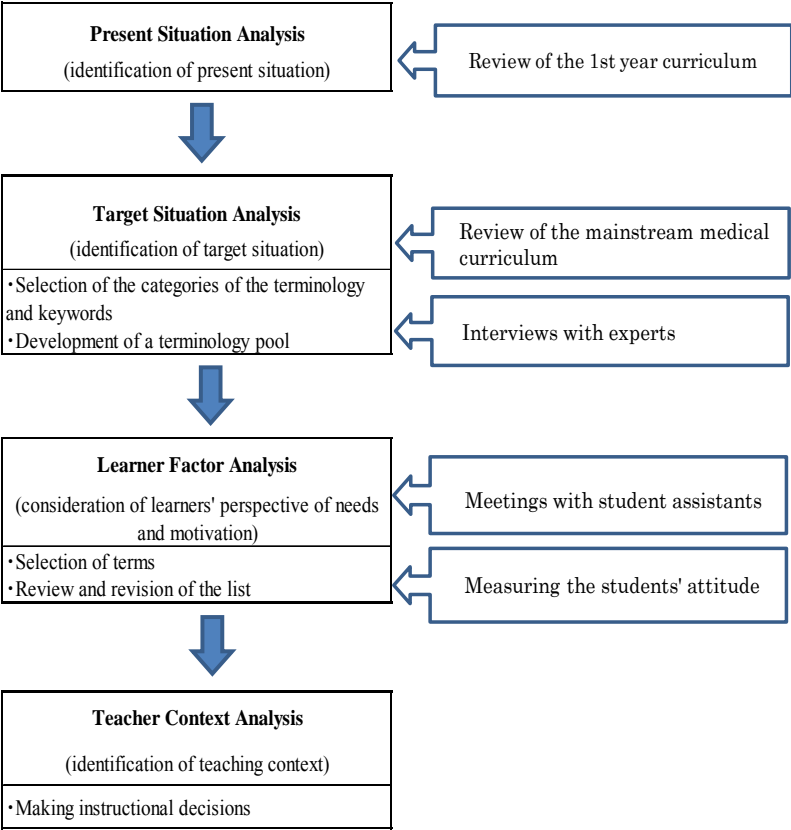


Figure 1. Flowchart of the development and implementation of the medical word list

Framework

The framework we used to develop the list was adapted from the Needs Analysis Framework proposed by Basturkmen (2010), who cited needs analysis as a key component in ESP course design. Her framework includes: present situation analysis, target situation analysis, learner factor analysis, and teaching context analysis. It also has a component on discourse analysis, which we chose not to include as it was not necessary for our purposes.

Present Situation Analysis

Present situation analysis refers to “identification of what learners do and do not know and can or cannot do in relation to the demands of the target situation” (Basturkmen, 2010, p. 19). To understand the range and depth of knowledge of medical terminology, in both Japanese and English, what students have obtained is important for setting a reasonable and efficient starting point for learning medical terminology. To this end, we reviewed the Biology and English curricula for first-year students. As described in the section above, Research Background and Rationale, the results indicated not all first-year students had a proper understanding of the vocabulary related to biology at the high school level nor were they given an equal chance to get exposure to advance biological terminology.

Target Situation Analysis

Target situation analysis is defined as “identification of tasks, activities and skills learners are/will be using English for; what the learners should ideally know and be able to do” (Basturkmen, 2010, p. 19). Since learners should be taught information they will really use (e.g., Dudley-Evans & St John, 1998; Kaewpet, 2009), having clear and concrete data on the target situation is important for curriculum design. In order to identify the target situation (i.e., medical terminology used by medical students, practitioners, and researchers), we took two measures: interviews with medical experts and review of the mainstream medical curriculum.

Interviews with experts. Two medical experts were selected for interviews. They were chosen because they were knowledgeable about the English medical terminology that medical students, doctors and researchers need to know and use in Japan and abroad. Both experts are medical doctors who have had international experience as a healthcare practitioner and/or researcher. Their current position is Professor of Medical Education Department at J University. The first author of this paper met one of the

doctors (Dr. A) once and had follow-up email correspondences. She met the other doctor (Dr. B) several times and kept in touch via e-mail throughout the word list development process (for a detailed content of those interviews, see the Meetings with Dr. B section).

The interviews and correspondence with the experts revealed three main points. First, it confirmed that medical students needed to learn medical terminology in English in their second and third years. This was partly because examinations in some medical courses asked for students' knowledge of terminology in English. Also, many, if not all, students need to read research papers in English in their third year. Second, many students will need to read and write research papers in English as well as present in English at conferences in the future. Third, the results of the interviews indicated that it was desirable for terminology in English to align with the overall medical curriculum.

In addition to the points above, the experts offered advice on not only when but also how an English version of medical terminology should be introduced to students; they suggested that English terms be introduced after students have learned them in Japanese. Since many medical terms are related to a complex concept, they should be introduced to students by a medical education professional rather than a "lay person", such as an English instructor. Also, for easier, more efficient, and accurate understanding of complex concepts, they should be explained in their native language first rather than in a foreign one.

Review of the mainstream medical curriculum. Responding to the experts' advice that terminology in English be presented in accordance with the mainstream courses, medical textbooks used in the second and third years were reviewed. The curriculum at J University contains various modules which are called zones and units. The university uses textbooks which are developed in-house with keywords at the beginning of each unit and zone. The English terminology lists were developed based on the categories listed in the textbooks. Table 1 shows the categories that have been extracted from the

textbook for second year students. As described in the table, Zone C is further divided into three subzones—C-1, C-2, and C-3—with C-2 and C-3 containing categories which overlap with each other in a cyclical manner.

Meetings with Dr. B. Once the categories for each English medical terminology list were selected, the first author of this paper met Dr. B several times for terminology pool development. The procedure was as follows. First, based on each category shown in Table 1, the first author of this paper came up with a large pool of related terms. When collecting the terms, she referred to the keywords given in the in-house medical textbooks and commercially available medical and nursing textbooks (e.g., Fremgen & Frucht, 2013; Guyton & Hall, 2010; Marieb, 2015). Second, the authors of this paper presented the large pool of terminology together with the keywords of the category to Dr. B at a meeting. From the terminology large pool, Dr. B selected terms that would be relevant and useful for students. The number of terms chosen was usually 30-70 per category, which went through another screening process based on learner factor analysis. Out of the original 30-70 terms, one or two subset(s) of the word list was/were generated.

Table 1
Categories of English Medical Word List for Second-Year Students Based on the In-house Medical Textbook

Zone / Unit Subzone / Subunit	Title of Zone / Unit of Medical Textbook Category for English List
Zone A / Unit 1	Anatomy anatomical position, planes, and directions respiratory system digestive system cardiovascular system
Zone B	Embryology and Biochemistry embryology biochemistry
Zone C	Physiology
C-1	blood muscles
C-2	mixed items (including cardiovascular, digestive, and respiratory systems) mixed items (including nervous and respiratory systems and endocrine secretion)
C-3	mixed items (including cardiovascular, reproductive, and urinary systems) mixed items (including respiratory system and endocrine secretion)

Learner Factor Analysis

Learner factor analysis is defined as “identification of learner factors such as their motivation, how they learn and their perceptions of their needs” (Basturkmen, 2010, p. 19). Learner motivation is closely related with their perception of needs and learning styles. According to self-determination theory (Deci & Ryan 1985; 2002), when people understand and internalize the value of the action, they are more intrinsically motivated (i.e., motivated to engage in something because the action itself is enjoyable and satisfying). Therefore, by considering the perception of students’ needs, instructors could better help students understand the value of learning medical terminology which in turn improves their motivation to learn it. For example, offering students different ways of learning terminology may improve students’ chances to learn in a way that fits their learning styles. This may help learners to accept the value of (some of the) tasks, which in turn facilitates their motivation to undertake the learning task(s). Therefore, taking students’ perception of needs and their

learning styles into consideration facilitates the enhancement of learner motivation. In the following subsection, we describe how we took into account perception of students' needs. As for our consideration of possibly different learning styles of students, the Teaching Context Analysis section will discuss it.

Meetings with student assistants. In order to identify students' perception of needs, the first author of this paper had meetings with student assistants (SAs). The SAs are undergraduate medical students who assist teaching of their peers. The SAs who participated in this study were not only fluent in English, but also had obtained good to decent grades in medical courses.

A meeting with the SAs was held basically every week (12 times in total) throughout the process of the list development. Each meeting took about one hour. In a meeting, the SAs were presented with a pool of terminology and asked to select terms that are highly relevant to the students. We tried to schedule a meeting on a category shortly after the mainstream medical course had covered the category. In this way, the SAs were able to better judge which terms in the pool were highly relevant because they remembered the content of the category very well. Also, this allowed English instructors to make a set of lists available for the English course promptly after the content had been taught in Japanese. The SAs selected approximately 20-40 terms per subset of the word list. Selection of the terms were done by discussion between the SAs, referring to the in-house textbooks, the notes that the SAs took during medical classes, and other medical and nursing textbooks (e.g., Fremgen & Frucht, 2013; Guyton & Hall, 2010; Marieb, 2015).

As the final step of a subset of the word list development, definitions and sometimes images, where desirable, of terms were added. All the definitions were given in English. A complete subset was uploaded to the internet-based vocabulary management and study application called Quizlet. The URL was then announced to the students. Also, a hardcopy version was made available for the students. Table 2 provides an overview of the finalized subsets for

second-year students. As etymological knowledge would help students to learn anatomy and physiology terms, which are predominantly rooted in Latin and Greek vocabulary (Aizawa, 1973; Nagita, Kobayashi, Tanaka, Itaya, & Shigeta, 2011), we decided to include common word roots, common suffixes, and common prefixes of medical terms in the word list. Figures 2 and 3 show example subsets. Each subset, in both mediums, was made available for the students approximately one week prior to the English for Medicine session where the content of the list was used.

Table 2
Overview of Medical Word List for Second-year Students

	Subset Title/Category	No. of Terms
1	Anatomical Position, Planes, and Directions	27
2	Common Word Roots	39
3	Common Suffixes	39
4	Common Prefixes	30
5	Respiratory System	21
6	Digestive System I	22
7	Digestive System II	20
8	Cardiovascular System I	20
9	Cardiovascular System II	18
10	Cardiovascular System III	20
11	Embryology	25
12	Biochemistry	27
13	Physiology Blood	24
14	Physiology Muscles	29
15	Zone C2-1	31
16	Zone C2-2	29
17	Zone C3-1	27
18	Zone C3-2	24

Note: Common word roots, common suffixes, and common prefixes were added to familiarize students with derivation of medical terms.

Medical Terminology List 11 - Embryology



単語



ゲーム






embryo	a human or animal in the early stages of development before it is born, hatched, etc.		☆ 🔊
umbilical cord	a long, narrow tube that connects an unborn baby to the placenta of its mother		☆ 🔊
meiosis	part of the process of gamete formation, consisting of chromosome conjugation and two cell divisions, in the course of which the diploid chromosome number becomes reduced to the haploid.		☆ 🔊
fertilization	the act or process of fertilizing an egg or a female animal or plant		☆ 🔊
blastocyst	A thin-walled hollow structure in early embryonic development that contains a cluster of cells called the inner cell mass from which the embryo arises. The outer layer of cells gives rise to the placenta and other supporting tissues		☆ 🔊

Figure 2. Sample word list (An online version of the Embryology subset)

<div>Quizlet</div> <div>Medical English - Cardiovascular System II</div> <div>Study online at quizlet.com/_1am1at</div>	
1. catecholamines	a group of molecules including epinephrine, norepinephrine, L-dopa, and related molecules with effects similar to those produced by activation of the sympathetic nervous system.
2. cyanosis	a bluish discoloration of the skin or mucous membranes due to excessive concentration of deoxyhemoglobin; indicates inadequate oxygen concentration in the blood.
3. diastole	the sequence of the cardiac cycle during which a heart chamber wall is relaxed.
4. diastolic pressure	the lowest pressure within the arterial blood stream occurring during each heart beat. The other component of blood pressure is systolic pressure, which refers to the highest arterial pressure during each heart beat.
5. diuretic	an agent that promotes the excretion of urine, thereby lowering blood volume and pressure.
6. dyspnea	subjective difficulty in breathing.
7. electrocardiogram	a recording of the electrical activity that accompanies the cardiac cycle; ECG or EKG.
8. fibrillation	a condition of cardiac muscle characterized electrically by random and continuously changing patterns of electrical activity and resulting in the inability of the myocardium to contract as a unit and pump blood. It can be fatal if it occurs in the ventricles.
9. heart rate	the speed of the heartbeat measured by the number of contractions of the heart per unit of time — typically beats per minute (bpm).
15. pulmonary circulation	the circulation of the blood through the lungs.
16. pulse	the rhythmic expansion and recoil of arteries resulting from heart contraction; can be felt from the outside of the body.
17. systemic circulation	the part of the cardiovascular system which carries oxygenated blood away from the heart to the body, and returns deoxygenated blood back to the heart.
18. systole	the muscular contraction of a heart chamber during the cardiac cycle.
19. systolic pressure	the highest arterial pressure during each heart beat.
20. vasodilation	widening of the lumen of blood vessels due to relaxation of the smooth muscles in their walls.

Figure 3. Sample word list (A hard copy version of the Cardiovascular System subset)

Teaching Context Analysis

Teaching context analysis refers to “identification of factors related to the environment in which the course will run. Consideration of what realistically the ESP course and teacher can offer” (Basturkmen, 2010, p. 19). When considering the needs of the students, it was evident that several factors had to be addressed. Students needed to practice in a way that allowed them to more readily recognize terminology as it appeared in other medical classes. Activities and teaching methods had to avoid tedious route drills and memorization in order to avoid demotivating the students. Since English

ability and learning styles varied between students, it was also important that classroom activities be designed to accommodate everyone as much as possible. Furthermore, the design and consideration of classroom activities followed the guidelines suggested by Basturkmen by taking into account what the student can do independently and what the student can achieve by negotiating with others.

Implementation

One of the most difficult aspects of second language learning is the memorization of vocabulary sets (Meara, 1980). This difficulty may be compounded by vocabulary sets that are made up of technical jargon and specialized words, such as medical terminology. The objective was to implement a variety of approaches in order to give students, who may have various learning styles and needs, an increased opportunity to learn and review the medical terminology.

According to Carter and McCarthy (1988), unless a way was found to recycle new vocabulary into long-term memory, new words would most likely be forgotten. Therefore, the implementation methods that were chosen were designed to help students to recycle new vocabulary into long-term memory through repetition, cooperative activities, and communicative practice. Implementation took the form of, weekly quizzes, games, e-learning technology, and hardcopy handouts.

Weekly quizzes. Each week, at the beginning of class, students were given a quiz on the previous week's subset of the word list. The purpose of the quiz was to motivate students to practice and study terminology outside of the classroom. Weekly quizzes were also used as a tool for reducing tardiness and thereby maximizing classroom study. Students who arrived to class later than 5 or 10 minutes received an automatic zero for that day's quiz. The quizzes also provided motivation for an evenly paced study of the entire pool of medical terminology over the course of the academic year.

Supporters of frequent quizzing argue that it can improve practice and

review, increase opportunity for feedback and have a positive influence on students' study time. The opponents, on the other hand, suggest that too frequent quizzing might impede learning by inhibiting larger units of instructional material and frustrating anxious students. Despite existing opposition, research has shown that frequent quizzes can help students retain study data and be more prepared for high stakes exams (Gholami & Moghaddam, 2013).

Games. As Sokmen(1997) points out, providing supplementary interactions with the word list is one method to facilitate vocabulary acquisition. One way to do this is through the use of games. Games can be defined as an organized activity that has the characteristics of being a particular task or objective, managed by a set of rules, containing an element of competition, and facilitating communication between players by spoken or written language (Richards, Platt, & Platt, 1992, p. 219).

According to Hadfield (1999), students go through three distinct processes when learning new vocabulary: 1) solidifying the meaning of the word in their mind 2) personalize the word 3) communicate with others using the word. He also notes that games can help learners navigate these three processes. Games allow for extensive repetition without the students feeling as if they have spent an enormous amount of time repeating the same set of words over and over again.

Games can also provide an opportunity for communication between students that bridge the gap between the classroom and the real world by allowing students to use the vocabulary that they have learned. They are also highly motivating since they can be both challenging and entertaining at the same time (Ersöz, 2000). Nguyen and Nga reported in their research that learners like the non-academic feel of the atmosphere, competitiveness and motivation brought to the classroom by games. They also argue they can learn the material quickly because the environment was not stressful but instead enjoyable (Nguyen & Khuat, 2003). Finally, in a study done by Riahipour and Saba (2012), it was found that games had an important role in teaching and

learning new vocabulary in ESP courses. In particular, they found games to be a useful way the help nursing students learn new medical terminology because it reduced anxiety in some learners.

Game example. For the implementation and practice of medical terminology the game Battleship was used. Battleship is played in pairs using a grid that has been drawn on a sheet of paper. The x and y axis were marked by the terminology being practiced for that day. Students were instructed to shade in sections of the grid horizontally or diagonally. The shaded area represents ships or any other objects the instructor would like them to represent. In the traditional Battleship game, five shaded blocks represent a battleship, four shaded blocks represent an aircraft carrier, three blocks represent a cruiser and two blocks represent a submarine. In Figure 3, the top grid is used by the players to keep track of the coordinates they have called. The bottom grid is where their ships have been hidden. After the grid blocks have been shaded, the students get into pairs. They must keep their sheet out of view of their partners. The objective of the game is for each person to locate the opponents hidden ships by calling out coordinates from the grid. For example, Student B would say to Student A “Is there something at ‘cephalic’ and ‘prone’?” In Figure 2 we can see that the space on the grid located at “cephalic” and “prone” has not been shaded in. Therefore, Student A would respond by saying, “No, there is nothing at “cephalic” and “prone”. If, however, Student B had asked if there was something at “gnosis” and “cardi/o”, for example, then Student A would have responded by saying something like, “Oh no! There is something at “gnosis” and “cardi/o”. At which point, it would be Student A’s turn to locate Student B’s hidden ships. In this game the rules can vary depending on the time and other variables decided by the instructor. For example, the rules could be set so that students only have to find part of a hidden ship or they could be set so that students must locate, one by one, each block of a hidden ship. Teachers can also change the phrases to be used by the students to match their teaching objectives. For example, they can have students call out the definitions related to the coordinates. Instead of saying “Is

there something at ‘cephalic’ and ‘prone’?”, Student B could say, “Is there something at “related to the head” and “front surface downward?” The game continues until time runs out or all of the hidden ships have been found.

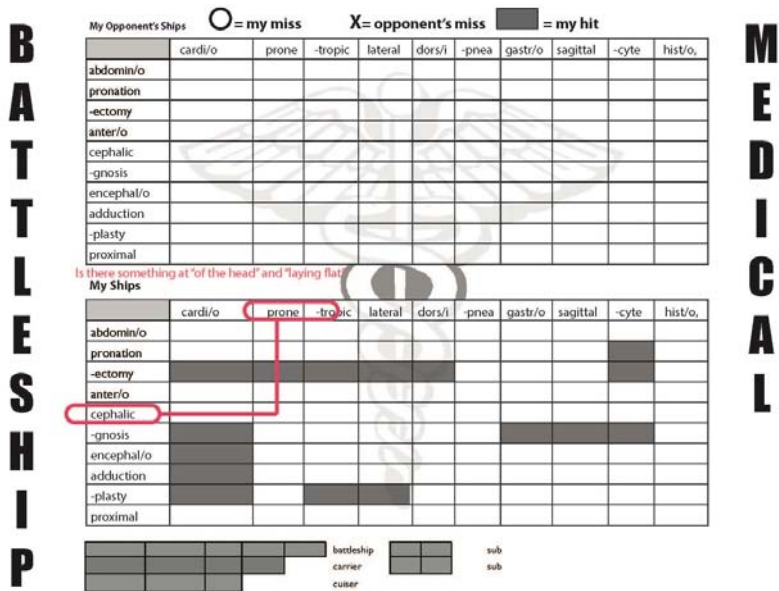


Figure 4. Battleship Grid with an empty grid on the top for keeping track and a grid on the bottom containing the hidden ships

A situation is created by the game in which each student must repeat the words on the grid many times before they can complete the objective. Research done by Webb indicates that repetition increases knowledge. If a learner encounters unknown words 10 times in context, then large learning gains may occur (2007). Standard repetition drills, where the instructor says the word and students repeat, risk the possibility of demotivating the students to apathy and boredom. Through Battleship and other such games, students are distanced from the awareness of repetition. The thrill of competition and focus on achieving an objective mask the fact that they are repeating the same phrases dozens of times in one classroom sitting.

Although Webb suggests that repetition be done in context, the games introduce repetition in a context that satisfies students' needs in the classroom but is also outside of the realm where medical terminology is naturally used. However, it was speculated that when students encounter the terminology they practiced and memorized through the game, in the context of clinical setting, they will be more readily able to understand and recall the terms. A longitudinal study of the students must be done in order to determine if this method of implementation and practice will have the desired effect.

E-learning technology. Apart from games, the web-based application, Quizlet, was also used to implement and practice medical terminology lists for self-study. As mentioned above, students were given a hardcopy of the weekly terminology lists. Each printout also included a Quizlet link. When practicing independently, the option of hardcopy and / or e-learning technology allowed students to choose their method of practice based on their own personal study styles. Students who prefer online study could take advantage of the many tools provided online. On the other hand, students who prefer a more analog method of study could do so using the handouts.

For those who chose to pursue online study, technologies like Quizlet provide students with a different set of varied practice experiences. Whether through handouts or e-learning technologies, learners who apply multiple learning strategies tend to be more successful in learning (Johnson & Hefernan, 2006). Research also indicates that incorporation of multimedia and technology in the English language classroom has become the preferred way many students would like to learn (Hu & Deng, 2007). While considering these two aspects of the learning context, it was believed that by using the above-mentioned applications, student motivation could be maintained by alleviating the boredom that might come from repeating the same types of activities too many times during a semester. Both games and technology also help to bridge the gap between contextualized and decontextualized learning by implementing the decontextualized terminology lists into the contextualized setting of the activity or program.

While, the overall context of the computer-assisted learning environment is different from the context of the clinical setting, it was hoped that online applications could facilitate, in learners, a shift of medical terminology lists from short term memory to long term memory. When students encounter the terminology again in the context of the clinical setting it was hoped that students would have a better chance of quickly recalling and understand these terms than if they had simply memorized a list of medical terms and never practiced them in any context. One final benefit of Quizlet is that students can access and practice terminology lists online via their personal computer or smart device. This gives them the freedom to study and review the terminology lists anywhere they like and at their own pace.

Research supports the idea that programs like Quizlet can support the transferability of vocabulary in second language learners. It is important to mention transferability here because one of the goals of language teaching is to nurture communicative language use outside of the learning context (Franciosi, 2017). As mentioned previously, it is hoped that students will be able to transfer meaning and understanding from the context of the classroom to the clinical context. As with the games described in the section above, a longitudinal study needs to be done to determine the level of effectiveness.

Hardcopy handouts. Even though we recommend students to use Quizlet to learn and practice medical terminology, we also provided them with hardcopies of each subset of the list as well. This is largely because, at the beginning of the course, a couple of instructors were directly approached by students and asked if they could receive hardcopies of the subsets. Two students even asked if we could provide them with a booklet that contains the entire list. It seemed that at least some students preferred learning by using a printed-out version of the list. It has been pointed out that preferred learning strategies may be different between instructors and learners (Hutchinson & Waters, 1987), and thus in the learner factor analysis we should have examined learning strategies that students use. As discussed in the learner factor analysis, taking students' perception of needs and their learning styles into consideration

helps to enhance learner motivation. Motivation was one of the three factors we made sure to take into consideration upon list implementation, and therefore, we decided to prepare handouts for students in addition to the e-learning environment.

Evaluating Learning Outcomes, the List, and List Implementation

In order to evaluate learning outcomes, students' scores in the medical terminology portion of the mid-term and final exams were used. To evaluate the terminology list and its implementation in classes, we administered a questionnaire at the end of the academic year. One hundred and twenty-eight second-year students took the exams and responded to the questionnaire.

Learning outcomes. The medical terminology portion of the mid-term exam was developed based on 236 terms that had been presented to the students in the first semester. Forty questions were asked in the mid-term: 12 true-false, 12 multiple choice, 11 matching, and 5 writing questions. The final exam was also based on 236 terms, which had been introduced to the students in the second semester. Fifty questions were asked in the final: 12 true-false, 12 multiple choice, 11 matching, and 15 writing questions. Sample final-exam questions are presented in Figure 5. Matching questions were not provided in the figure due to limitations of space.

True/false question

Ventricle - A muscular chamber that pumps blood out of the heart and into the circulatory system.

True

False

Multiple choice question

A tubular portion of the GI tract that leads from the pharynx to the stomach as it passes through the thoracic cavity.

a. esophagus

b. mastication

c. motor area

d. ureter

Written question

The globular head of a myosin molecule that projects from a myosin filament in muscle and in the sliding filament hypothesis of muscle contraction is held to attach temporarily to an adjacent actin filament and draw it into the A band of a sarcomere between the myosin filaments.

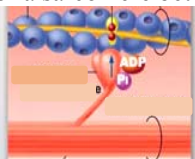


Figure 5. Sample questions developed for the final exam

The questionnaire. The questionnaire included the following items:

- Did the terminology list and the list-related activities have immediate usefulness for you?
- Do you think the list and the activities will become useful for you in the future?
- For future reference, please let us know of your opinions and suggestions about the list and English classes that used the list.

After the first and second questions, a four-point Likert scale (1- very useful, 2- somewhat useful, 3- not so useful, 4-not useful at all) was used to measure the respondents' perception of usefulness of the list and list-related activities. Respondents were asked to circle one number which is the closest to their feelings. Following the Likert scale, students were asked to write

reason(s) for their choice on the scale. As for the third item in the questionnaire, some space was given so that students could freely write their opinions and suggestions on the list and its implementation.

Results and Discussion

This section presents the results of the mid-term and final exams, questionnaire and discusses them. Based on the discussion, suggestions for the modification of the list, its implementation, and future research are put forth.

Mid-term and Final Exams

Table 3, Figures 6 and 7 show the descriptive statistics on the students' scores for the terminology portions of the mid-term and final exams. Actual test scores (mid-term: 40 points as full marks; final: 50 points as full marks) were converted into percentages of correct answers.

Table 3

Descriptive Statistics on the Results of Mid-term and Final Exams

Exam	<i>M</i>	<i>SD</i>	minimum	maximum
mid-term	70.78	17.429	32	98
final	70.55	19.103	28	100

Note. N=128. The values in the table show the percentages of correct answers.

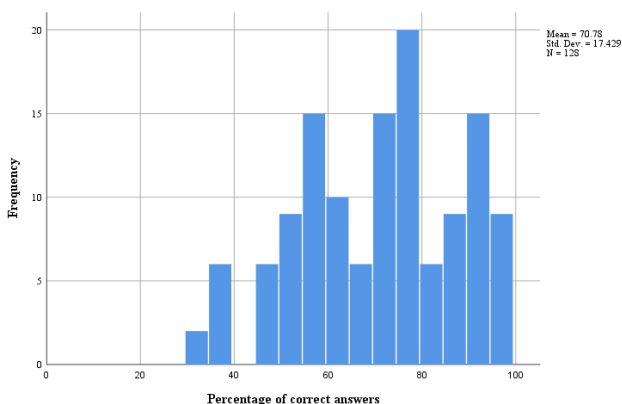


Figure 6. The results of Mid-term Exam

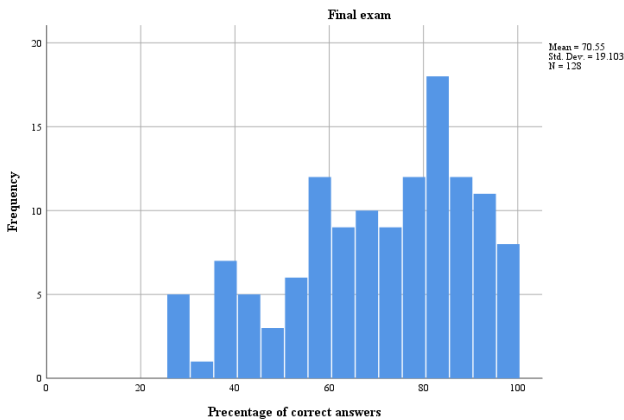


Figure 7. The results of Final Exam

Average rates of correct answers were a slightly above 70 % in both the mid-term and final exams. Given the number (236 terms per semester), novelty, and difficulty of the medical terms, it can be said that students learned the vocabulary fairly well. It is impressive that 24 students in the mid-term and 19 students in the final marked more than 90 % correctly.

Students’ Perception on the Immediate Usefulness of the List

Figure 8 shows the students’ perception on the immediate usefulness of the medical terminology list in English and list-related activities offered in the English for Medicine course. Below is a description of students’ attitudes and opinions towards the list.

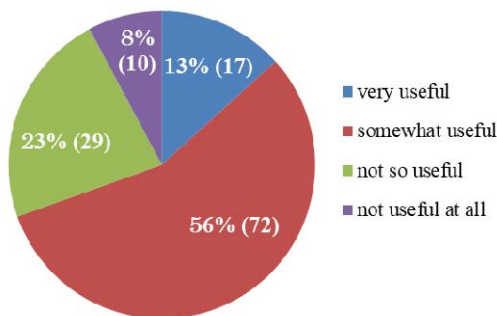


Figure 8. Students' perception on immediate usefulness of the word list. $N=128$.

Positive attitudes. The results of the questionnaire indicated that approximately 70% of students responded positively towards the terminology list introduced in the English course. The most common reason why they thought the list had immediate usefulness for them was that learning English terminology helped them to learn and/or review the contents of mainstream medical courses. This indicates that the target situation analysis and learner factor analysis were successful. Based on the target situation analysis (i.e., interviews with medical experts and scrutiny of the medical curriculum), we tried our best to present to our students the English version of medical terms in accordance with the mainstream medical curriculum, in most cases shortly after students had learned the terms in Japanese from medical professors. In the learner factor analysis (i.e., meetings with SAs), we selected highly relevant terms for the students. Thanks to the meticulous selection of the terms and fine-tuned timings of term presentations to students, the English version of terminology facilitated students learning of medical terms, not only in English, but also in Japanese.

Eleven students wrote that learning terminology in English helped them to read academic papers. The target situation analysis helped us to recognize that many third-year students are required to read academic papers in English. We were pleasantly surprised that some second-year students, such as those who

are interested in becoming researchers, had already started reading academic papers in English. For them, learning terminology in English had a tangible and practical benefit.

One student wrote that by learning common word roots, prefixes and suffixes of medical terminology, she became able to understand and remember medical terms more easily. She mentioned that by using her etymological knowledge, she could often infer the meaning of a newly encountered medical term. Another student felt that more emphasis should be given on etymology.

Several students felt that learning medical terminology in English classes was useful because they needed someone to push them. These students may not have actually recognized the immediate benefit of knowing medical terminology in English, but acknowledged the future usefulness of it. In this situation, it may be difficult for some students to learn terminology by themselves. Another factor worth considering here is that students do not have English classes after the first half of their third year, which could mean that when they need to use terminology in English, they would not have English classes anymore or English instructors to push them. These may be the basis of the reason why several students thought the list introduced in the English course was useful.

Two students wrote that learning terminology improved their motivation to learn English. None of them described concretely how the list enhanced their motivation. However, most medical students are, of course, interested in learning medicine. Providing a module in the English course that is closely related to what students learn in medical courses could have facilitated their engagement in English classes.

Negative attitudes. According to Figure 8, approximately 30% of the students did not acknowledge the immediate usefulness of the terminology list and its implementation in English classes. There were three common reasons why such students did not see the value of the list. First, several students wrote that, in the context of their medical studies, they have little to no opportunity to use medical terminology in English. This was expected to some extent. The

target situation analysis conducted before the list development revealed that exams in some medical courses ask for students' knowledge of terminology in English. However, as knowledge of terminology in English is not being asked in all medical courses, some students consider that there are few situations where they need to use terminology in English. Indeed, if a student decides to give up on the test questions that ask him/her to write medical terms in English and focus on other parts, he/she can still pass. Therefore, some students may have failed to see the value of learning terminology in English.

Second, six students wrote that they did not think the list was useful because they had forgotten the words soon after the quizzes were given in the English course. As described in the teaching context analysis section, we tried to help students to remember the terminology by offering review activities. Also, we gave students a review test as a part of the final exam. Nevertheless, some students felt that not enough was done. A couple of students suggested that quizzes be repeated so that they could review each set of list more easily than cramming all the sets before the final. Another possible way to help retain students' memory of terminology is to have more activities which use the terms in class. From a different aspect, a few students argued that the number of terms they need to remember in a week (20-40) was too large.

The third most common reason why some students did not think the list useful was because the definitions of terms were given in English. Three students wrote that having definitions in English only may have led them to misunderstand the meanings of some words. Even though the English version of terms was not presented to students until they had learned them in Japanese, it seems that an English-only list was difficult for some students, probably those with lower English ability. There are two ways to tackle this problem. One is to add Japanese terms or definitions to the list. Laufer and Shmueli (1997) point out that words glossed with students' L1 were better retained than those explained in their TL (English). This point may be related to the difficulties some students have with retaining the terms presented in this course. The other way of improving the situation is to simplify, wherever possible, the

definitions in English. We must admit that some of the explanations of the terms were given in long, linguistically complicated sentences and thus possibly confused students whose English was not strong. By using easier and simpler English sentences, students at all English levels may be able to understand the terminology. This solution has another benefit. By keeping English definitions in the list and making them more understandable, we can retain the amount of students' exposure to English. This is particularly important in the EFL setting where learners do not have much exposure to English to promote acquisition of the language.

Students' Perception of Usefulness of the Terminology List for the Future

Figure 9 shows the students' perception on the future usefulness of the medical terminology list in English and list-related activities offered in the English for Medicine course.

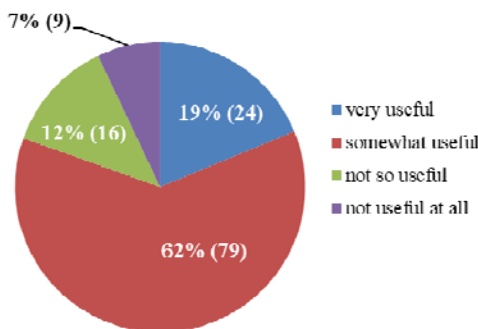


Figure 9. Students' perception of usefulness of the word list for the future. *N*=128.

Positive attitudes. Eighty one percent of all the students thought that the list would be useful for them in the future. In the questionnaire, several reasons were written to express why students felt that way. The most common reason was that the knowledge of medical terminology in English would be necessary for future studies and practices. Based on the questionnaire results, situations

where the information learned from the list would be useful included: reading academic papers, accessing information abroad, studying abroad, presenting at international conferences, studying for the United States Medical Licensing Examination, and practicing medicine abroad.

Two points should be brought up here. First, students' perception of the future needs of English medical terms can be considered highly accurate. In the Target Situation Analysis, interviews with experts revealed that medical students would probably need to read, write, and present medical papers in English when they become a doctor or researcher. The students' responses to the end-of-the-term questionnaire had a large overlap with the results of the Target Situation Analysis.

Second, it is notable that a good portion, more than ten percent, of the students perceived the list's usefulness in the future even though they could not see the relevance to their current context. For such students, as stated previously, it may have been difficult to see the immediate usefulness of the English list because they were required to present their knowledge of English medical terms in only some, not all, of the medical course exams. Moreover, as second-year and third-year undergraduate students, they did not have much exposure to the environment where medical terms in English were used. Nevertheless, they are correctly aware that it may become important to have knowledge of terminology in English and have therefore accepted and understood the value of learning medical terminology.

In the future English for Medicine classroom, it may be useful to encourage students to imagine their future selves reading, writing, and presenting papers in English. As a vivid image of future selves has the capacity to regulate behavior (Higgins, Roney, Crowe, & Hymes, 1994; Dörnyei & Ushioda, 2009; Magid & Chan, 2011). Having students have a vision of their future selves using English may help enhance their motivation to learn medical terminology in English.

Negative attitudes. According to Figure 9, slightly less than 20 % of the students did not see the future usefulness of the terminology list. There were

two main reasons for their opinion. First, a few students wrote that learning the list would not be useful in the future because “I will forget the words before I become a doctor”. It does not seem that they negate the usefulness of the list per se; rather, they did not see the point of learning it now because they will forget it before they actually need it. Two students wrote that they forget because having definitions of the terms in English only made it very difficult for them to understand and learn, let alone to remember, the words. As discussed and suggested in the Students’ Perception on the Immediate Usefulness of the List section, the definitions in English should be simplified as much as possible to improve the situation.

The other common reason for not feeling future usefulness of the list was the perceived lack of necessity of using English in the future. Four students wrote “I won’t go abroad. Only students who plan to go abroad should learn terminology in English”. This may or may not be true, because in this globalized era, doctors in Japan may need to examine patients who do not speak Japanese. To tackle this problem, pedagogical intervention could be used to help students to imagine the situation where they need to use English as a doctor. One way of facilitating students’ vision is to invite a guest speaker to the class. The speaker should be a doctor who practices in Japan and uses English. By listening to a doctor having faced situations where he or she needed English, students may be able to understand the value of learning English, including medical terminology. By listening to an anecdote where the knowledge of English benefited the doctor, students who currently deny the value of learning medical English might become aware of it.

Conclusion

This study demonstrated the process of medical word list development and its implementation at the English for Medicine course offered at an undergraduate medical school in Japan. Prior to the list development, present situation analysis was conducted and revealed that the students who were to take the medical English course had little knowledge on medical terminology

in Japanese or English. Interview with experts in target situation analysis confirmed that the students should learn medical terminology in English when they are in the second and third year. It was identified that the students would probably need to read, write, and present papers in the medical field in the future. The interview results also pointed out that the terminology in English should be presented in accordance with the medical curriculum. Further target situation analysis, the review of the mainstream medical curriculum and additional meetings with one of the experts, enabled us to develop the list that is closely accommodating with the medical curriculum. Then learner factor analysis was conducted so that we could take into account the perception of students' and their learning styles. The finalized list was presented to the students and implemented in the English for Medicine course. Based on teaching context analysis, implementation was designed to enhance students' motivation, effective use of classroom time, and retention of the target terminology. The mid-term and final exam scores show that the students in general learned medical terminology well. The students' evaluation of the list and its implementation illustrated that a vast majority of the students had positive attitude towards the list. In discussing the evaluation results, a few suggestions were made so that the list could be improved in the future.

References

- Aizawa, C. (1972). Kihonteki na igakueigo to Latin • Greek gogen (sono1) [Fundamental medical terms and their Greco-Roman origins.] 『杏林医学
会雑誌』 4(2), 89-98. doi:10.11434/kyorinmed.4.89
- Basturkmen, H. (2010). *Developing courses in English for specific purposes*. Hampshire, UK: Palgrave Macmillan.
- Carter, R., & McCarthy, M. (1988). *Vocabulary and language teaching*. London: Longman.
- Ersöz, A. (2000). Six games for the EFL/ESL classroom. *The Internet TESL Journal*, 6. Retrieved from the World Wide Web: <http://itesli.org/lessons/Ersoz-Games.html>

- Folse, K. (2004). *Vocabulary myth: Applying second language research to classroom, teaching*. Ann Arbor: University of Michigan Press.
- Franciosi, S. J. (2017). The effect of computer game-based learning on FL vocabulary transferability. *Educational Technology & Society*, 20, 123-133.
- Fremgen, B. F., & Frucht, S. S. (2013). *Medical terminology: A living language* (5th ed). Boston, MA: Pearson Education.
- Gholami, V., & Moghaddam, M. M. (2013). The effect of weekly quizzes on students' final achievement score. *I.J.Modern Education and Computer Science*, 1, 36-41.
- Guyton, A. C., & Hall, J. E. (2010). *Guyton seirigaku: Gencho dai 11 pan*. [Textbook of medical physiology] (11th ed). Tokyo: Elsevier Japan.
- Hadfield, J. (1999). *Beginners' communication games*. London: Longman.
- Higgins, E. T., Roney, C. J., Crowe, E., & Hymes, C. (1994). Ideal versus ought predilections for approach and avoidance: Distinct self-regulatory systems. *Journal of Personality and Social Psychology*, 66, 276-286, doi:10.1037//0022-3514.66.2.276
- Hoshino, Y. (2010). The categorical facilitation effects on L2 vocabulary learning in a classroom setting. *RELC Journal*, 41, 301-312. doi:10.1177/0033688210380558
- Hsu, W. (2013). Bridging the vocabulary gap for EFL medical undergraduates: The establishment of a medical word list. *Language Teaching Research*, 17, 454-484. doi: 10.1177/1362168813494121
- Hu, H.-p., & Deng, L.-j. (2007). Vocabulary acquisition in multimedia environment. *US-China Foreign Language*, 5(8), 55-59.
- Johnson, A., & Hefernan, N. (2006). The short readings project: A CALL reading activity utilizing vocabulary recycling. *Computer Assisted Language Learning*, 19, 63-77.
- Laufer, B., & Shmeli, K. (1997). Memorizing new words: Does teaching have anything to do with it? *RELC Journal*, 28, 89-108. doi:10.1177/003368829702800106
- Marieb, E. N. (2015). *Essentials of human anatomy & physiology* (11th ed).

- Boston, MA: Pearson Education.
- Meara, P. (1980). Vocabulary acquisition: A neglected aspect of language learning. *Language Teaching and Linguistics Abstracts*, 13, 221-246.
- Mungra, P., & Canziani, T. (2013). Lexicographic studies in medicine: Academic Word List for clinical case histories. *Ibérica*, 25, 39-62.
- Nagata, E., Kobayashi, N., Tanaka, N., Itaya, M. & Shigeta, T. (2011). Igakueigo blended learning eno kyoucyougakusyuu no dounyu no kouka to kadai. [Evaluation of collaborative learning introduced into blended e-learning of English medical terminology]. *Kawasaki Ikaishi Arts & Science*. 37, 83-93. doi:10.11482/KMJ-LAS(37)83-93.2011
- Nation, I. S. P. (1994). *New ways in teaching vocabulary*. Alexandria, VA: TESOL press.
- Nation, I. S. P. (2001). *Learning vocabulary in another language*. UK: Cambridge University Press.
- Nguyen, H. T., & Khuat, N. T. (2003). Learning vocabulary through games. *The Asian EFL Journal*. Retrieved from <http://www.gsedu.cn/tupianshangchuanmulu/zhongmeiwangluoyuyan/learning%20vocabulary%20through%20games.pdf>.
- Riahipour, P., & Saba, Z. (2012). ESP vocabulary instruction: Investigating the effect of using a game oriented teaching method for learners of English for nursing. *Journal of Language Teaching and Research*, 3, 1258-1266.
- Richards, J. C., Platt, J., & Platt, H. (1992). *Dictionary of language teaching and applied linguistics*. London: Longman.
- Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 199-227). UK: Cambridge University Press.
- Sokmen, A. J. (1997). Current trends in teaching second language vocabulary. In N. Schmitt, & M. McCarthy, *Vocabulary: Description, acquisition, and pedagogy* (pp. 237-257). UK: Cambridge University Press.
- Wang, J., Liang, S-I., & Ge, G-C. (2008). Establishment of a Medical Academic Word List. *English for Specific Purposes*, 27, 442-458.

doi:10.1016/j.esp.2008.05.003

Webb, S. (2007). The effects of repetition on vocabulary knowledge. *Applied
Linguistics*, 28, 46-65. doi:<http://dx.doi.org/10.1093/applin/aml048>